

Montana Public Service Commission

Forum on Electrical Metering and
Demand Management

February 22, 2006

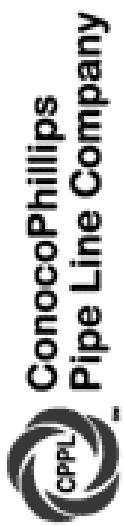
Roger Adam - ConocoPhillips

ConocoPhillips

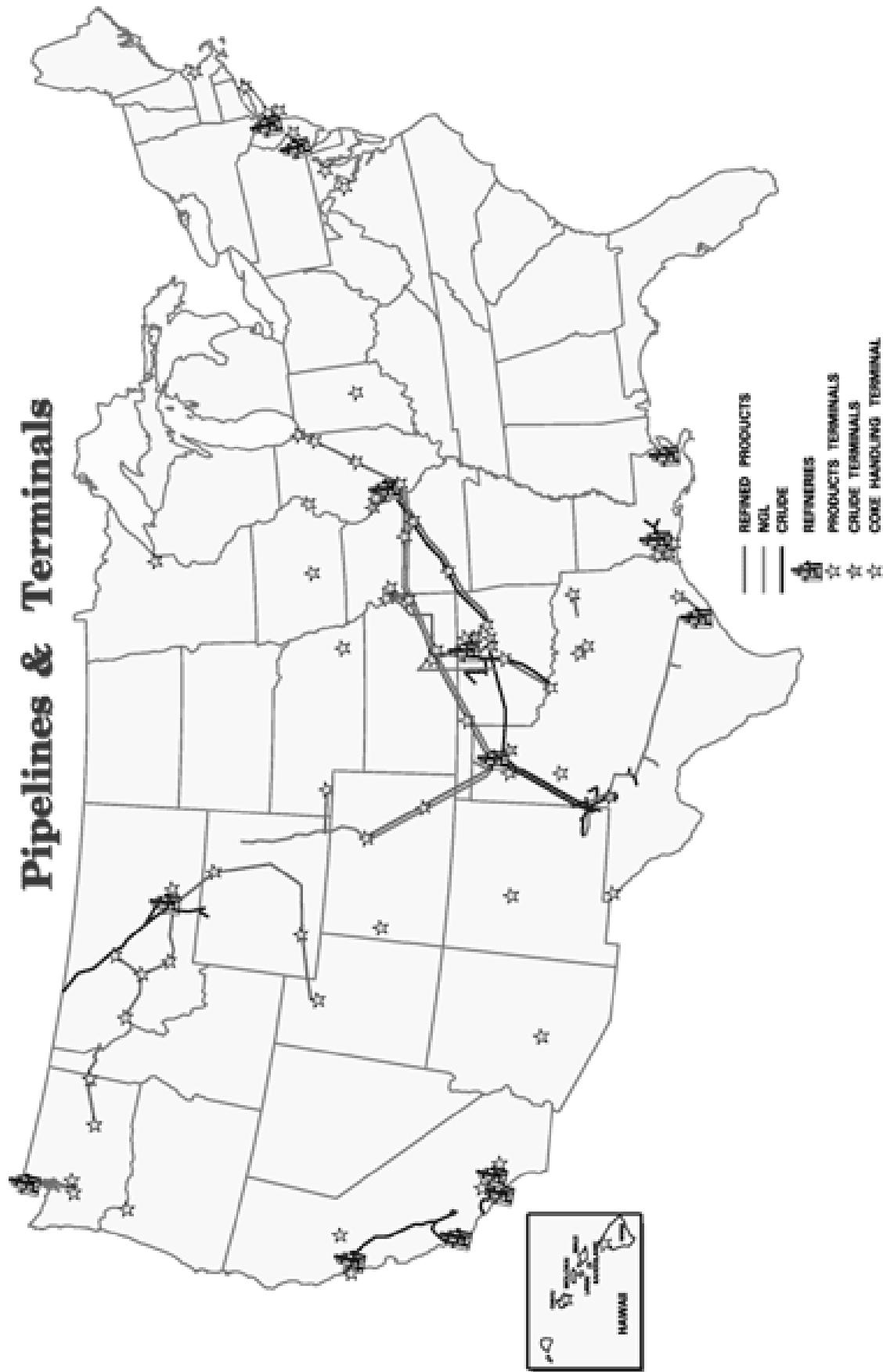
- Domestic refining capacity of approximately 2.6 million barrels per day from 12 U.S. refineries.
- Billings refinery processing capacity approximately 62,000 BPD of crude oil.
- Produce approximately 2.5 million gallons per day of gasoline and diesel fuel.
- Supplied by the Glacier pipeline system.
- Finished petroleum products from the refinery are delivered by pipeline, rail, and truck transport to markets in Montana, Washington, Colorado, Wyoming, Idaho, Utah, Nebraska, and South Dakota.



Billings Refinery



Pipelines & Terminals



Electrical power demand and utilization

- Billings Refinery operations: Currently 30 MW, growing to 35 MW with start-up of new Ultra Low Sulfur Diesel unit.
- Pipeline operations: Approximately 20 MW demand.
- Total electrical energy usage: 500,000,000 kWh per year.
- Annual kWh consumption comparable to about 30,000 residential users. Approximately the number of households in Billings.
- Cost of electricity for Montana operations is approximately \$30 million per year.

Energy utilization and operational efficiency is a BIG deal!

- Corporate goal to improve energy utilization index by 10% over the next 10 years.
- The Billings refinery is among the energy efficiency leaders when compared to other refineries within ConocoPhillips, as well as within the refining industry in general.
- So how do we maintain that advantage and move to the next level of energy efficiency.....

Energy Management

- You can't manage what you don't understand.

- Implementation of Electrical Power monitoring hardware and analysis tools.
- Six Sigma methodology for data analysis and defect elimination.
 - Data driven process to:
 - Define
 - Measure
 - Analyze
 - Improve
 - Control
 - Dedicated Energy Management teams and accountabilities

Electrical Power Monitoring

- Background and Overview
- Project began in late 1999
- Partial funding from USB credits
- Justification based on demand management opportunities and improved operational knowledge.
- Focused on plant distribution system and medium voltage motors.

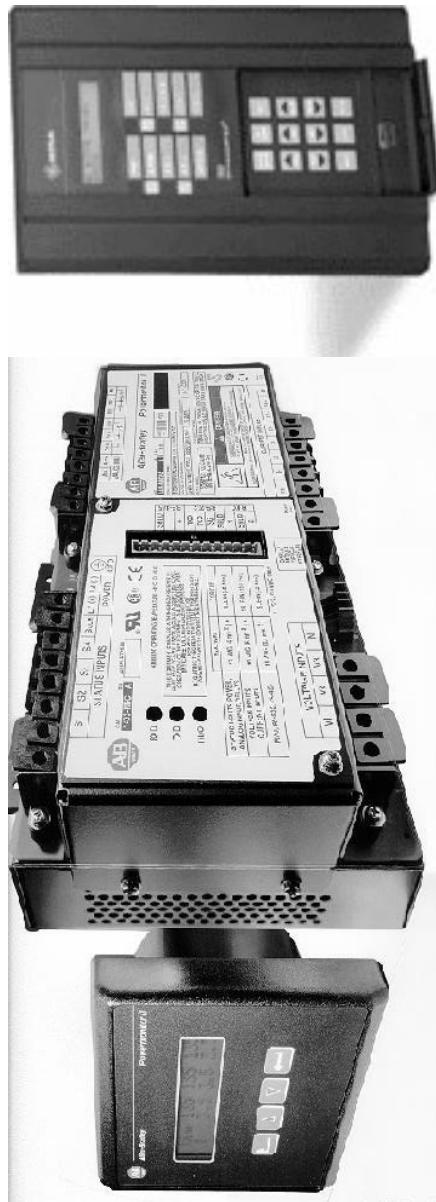
Electrical Power Monitoring

- Capabilities

- Real time monitoring of system loads
- Historical trending of load, demand, and operational data
- Minimum / Maximum log of amps, power demand, voltage, etc.
- Event recording
- Logic and switching capabilities for load management.
- System notifications and alarms

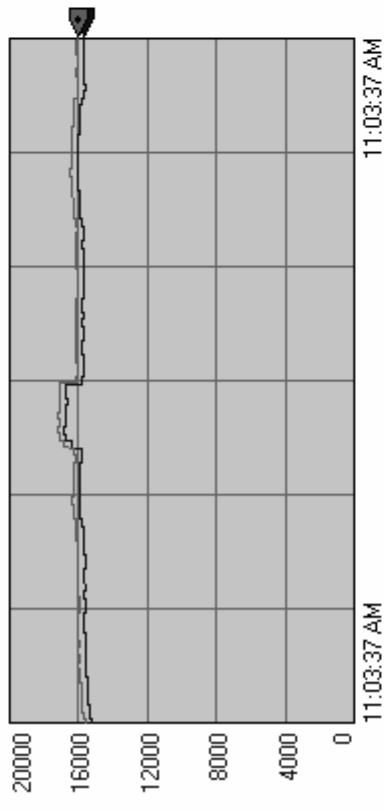
Electrical Power Monitoring

- 2- 15 kV substations (21 breakers)
- 3- 5 kV substations (33 breakers)
- 42- 5 kV motors
- 63- 480 volt drawout switchgear breakers



Wednesday, February 15, 2006 11:03:45 A

32014 kW
Total Power Demand

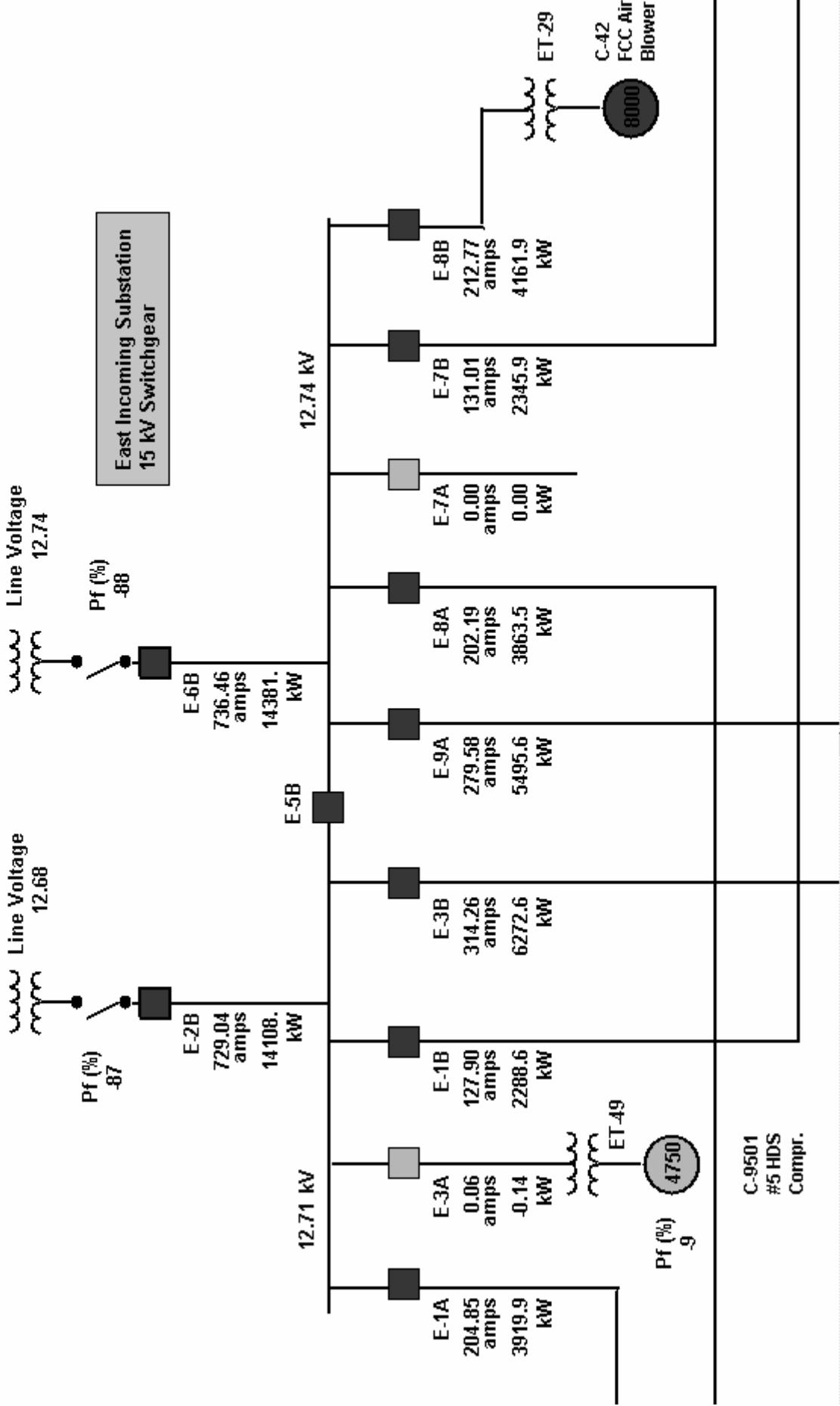


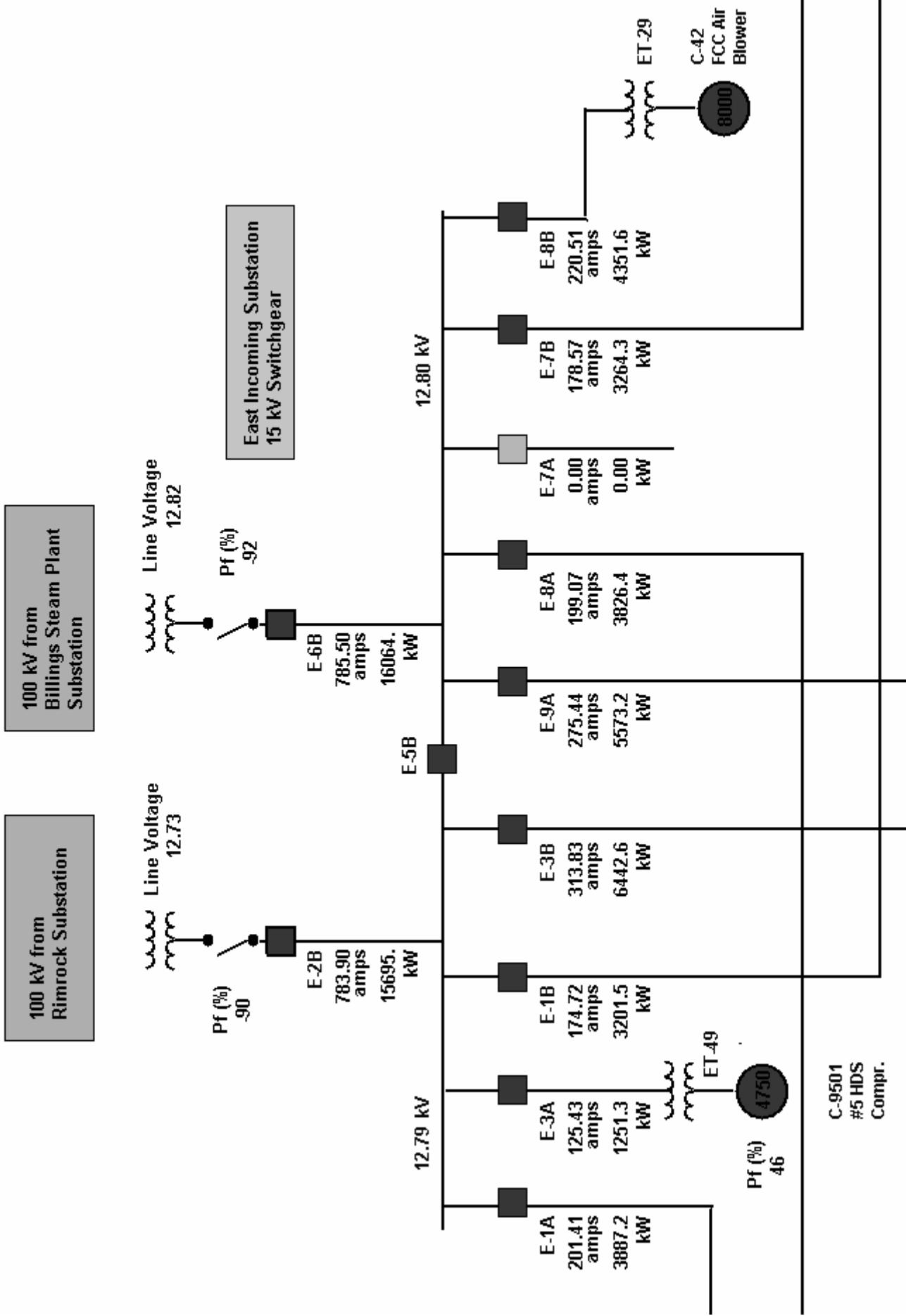
Zoom Out

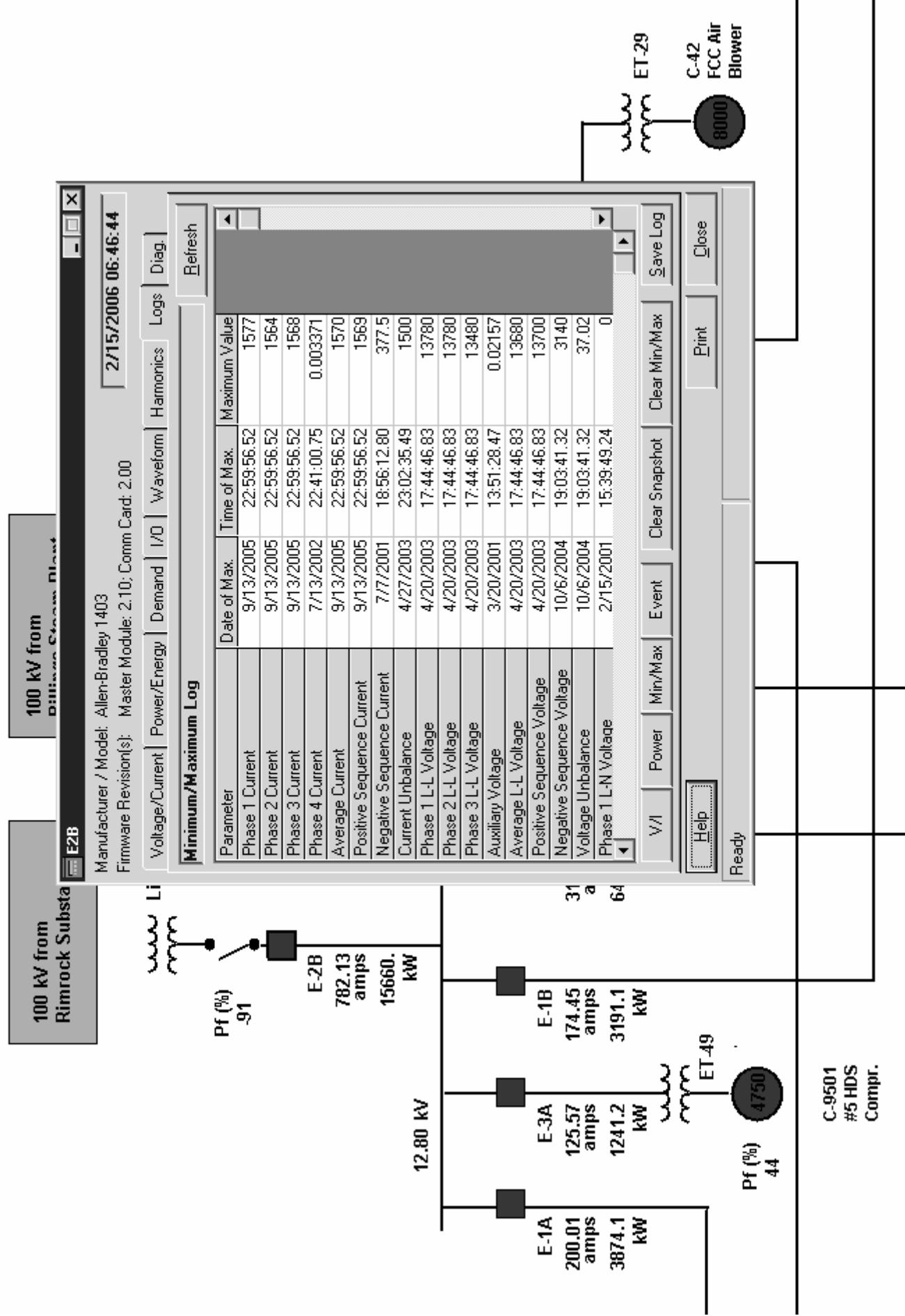
Close / Return

100 kV from
Rimrock Substation

100 kV from
Billings Steam Plant
Substation

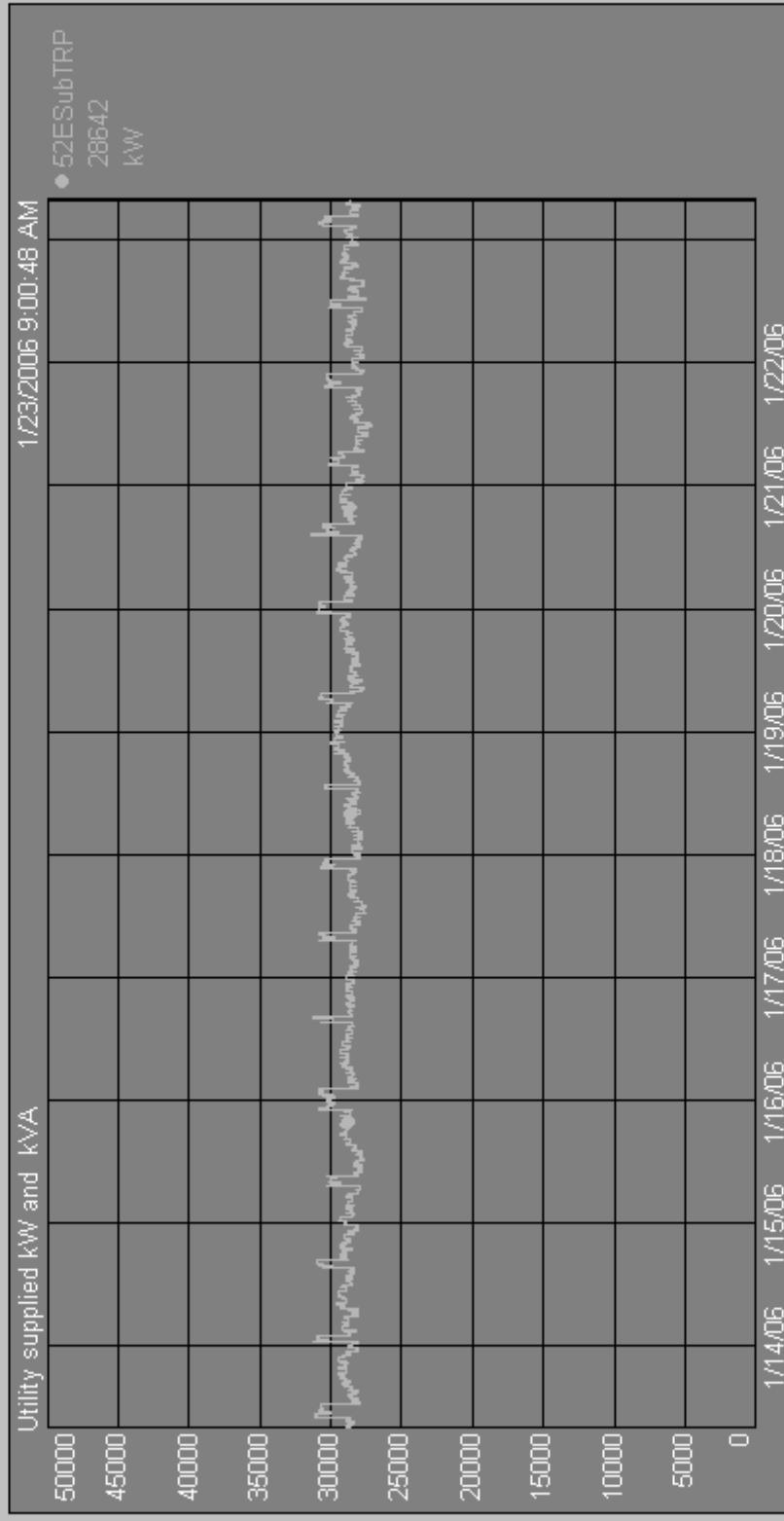








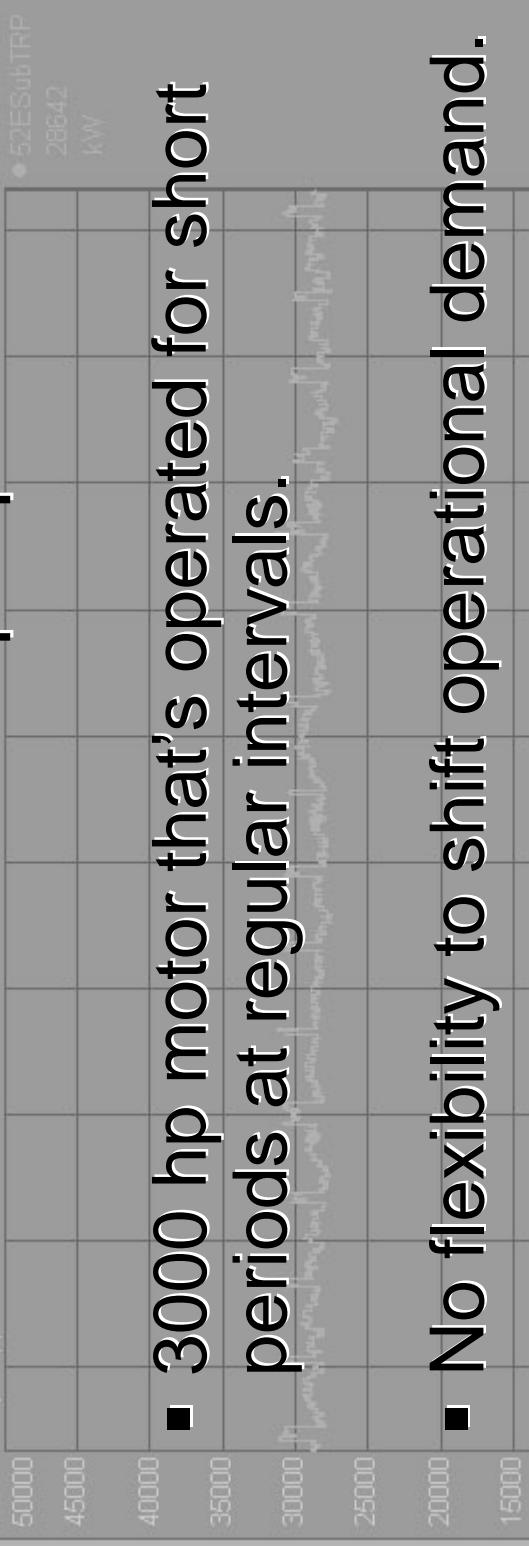
This is the summation of utility supplied power through breakers E-2B and E-6B from NorthWestern Energy



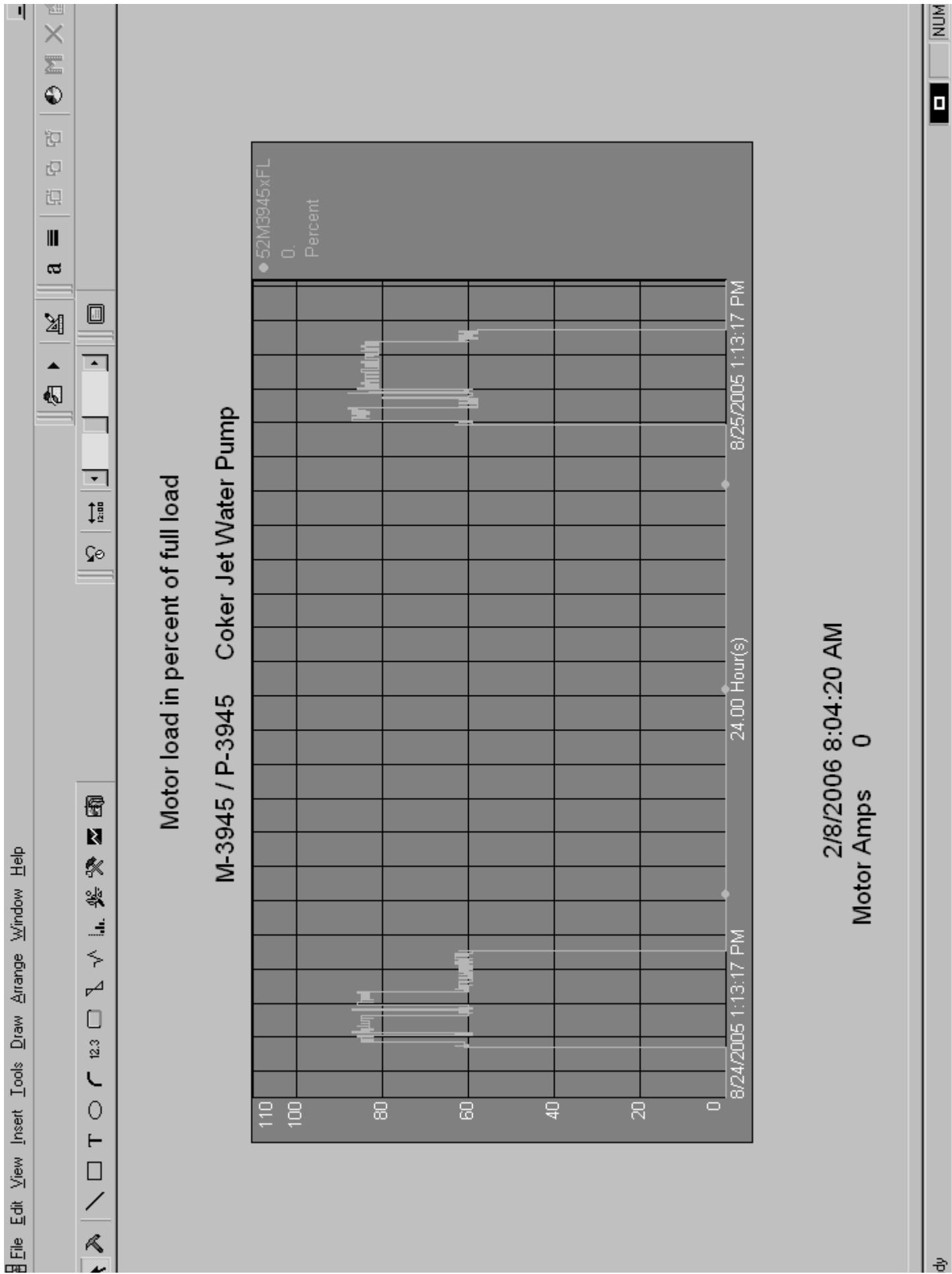
Energy Management Example

This is the summation of utility supplied power through breakers E-2B and E-6B from NorthWestern Energy

■ Coker Jet Water Pump Optimization



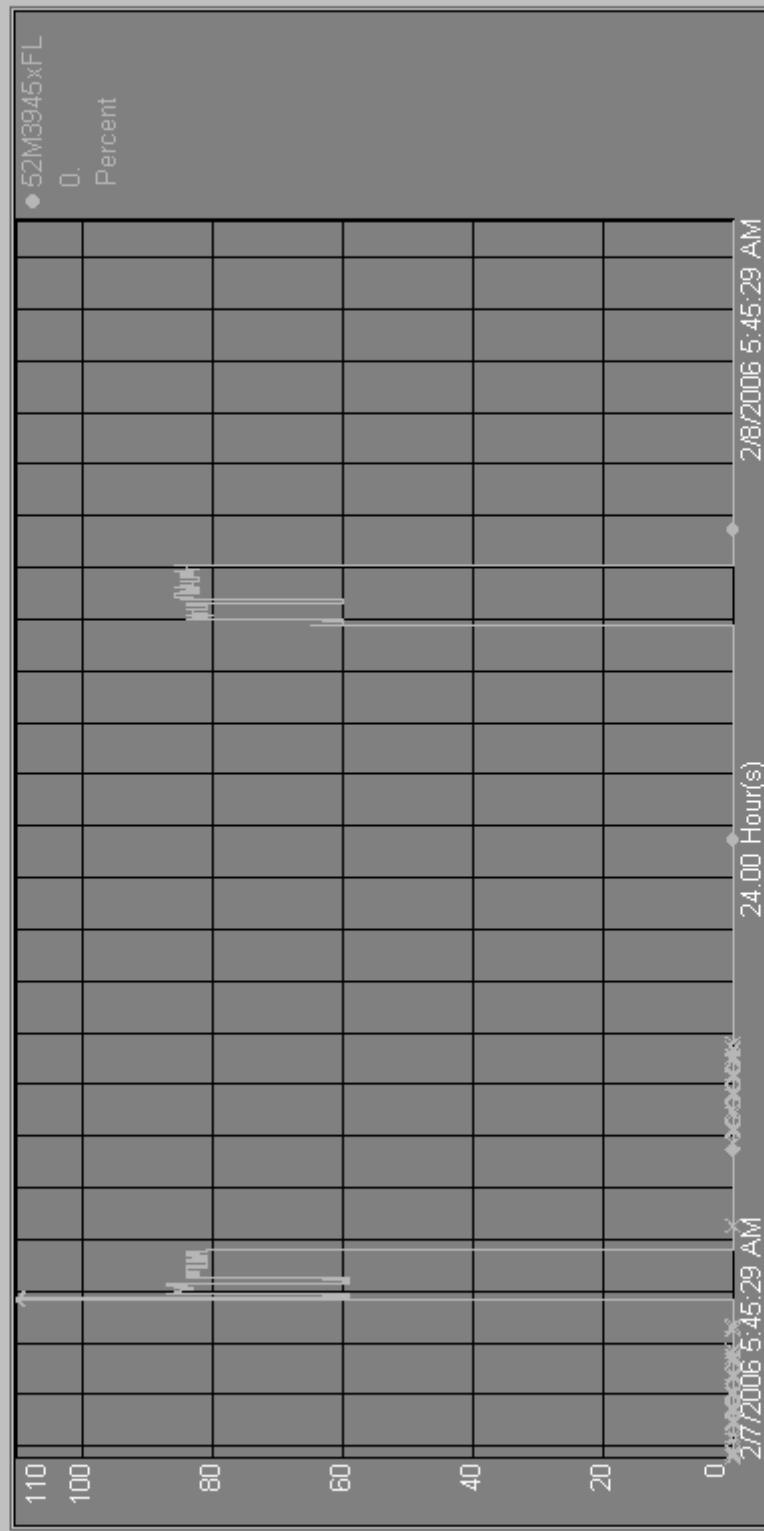
- 3000 hp motor that's operated for short periods at regular intervals.
- No flexibility to shift operational demand.
- Six Sigma analysis of operational data showed excessive variability.



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Motor load in percent of full load

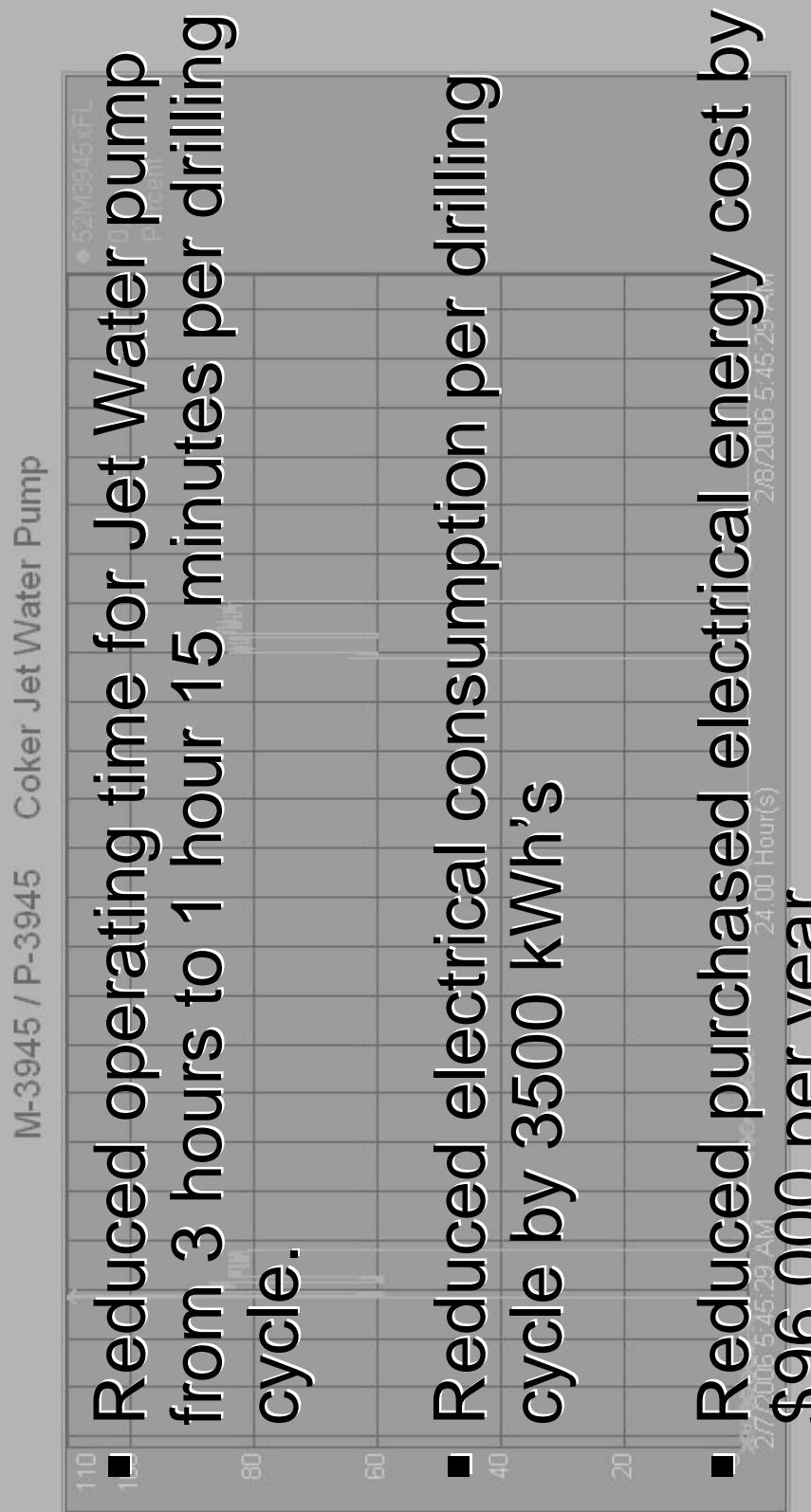
M-3945 / P-3945 Coker Jet Water Pump



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Motor Amps 0

Energy Management Results

■ Optimization improvements



Other Energy Management Opportunities

- Implementation of a process to more accurately purchase and schedule power demand.
- Demand tracking and load forecasting tools to minimize or eliminate purchased power imbalance penalties.
- Improvements resulted in \$115,000 per year savings associated with imbalance penalties.

Other Energy Management Opportunities

- FCC Energy Reduction Project

- Multi-million dollar project to capture waste heat from the FCC (Fluidized Catalytic Cracking Unit) to drive a steam turbine generator.
- Generate 1.5 MW of electrical power to offset purchased power requirements.
- On-site generation of 13,000 MWh's per year. At \$50 per MWh, electrical cost savings of \$650,000 per year.
- Important energy reduction project with marginal economics, made viable by partial funding with USB credits.

Summary

- You can't manage what you don't understand.
 - Hardware for data acquisition.
 - Six Sigma methodology to:
 - Define
 - Measure
 - Analyze
 - Improve
 - Control
- For large consumers, small changes can translate to significant energy and operating cost savings.
- Energy improvement projects requiring capital expenditures compete with other projects and business objectives for implementation.
 - Other drivers are often necessary to move projects forward.
- Improvements will only be implemented and sustained if reflected in the bottom line.